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AUDIO RECORDING AND REPRODUCING EQUIPMENT, TAPE,(U)
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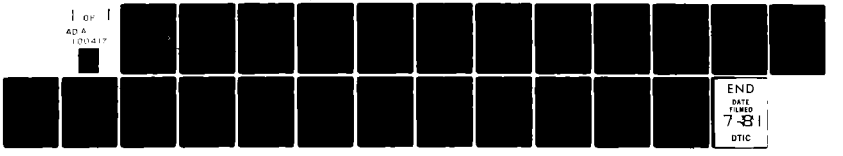

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Capstan Speed
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Outlines test procedures and methods for use in evaluating the performance of audio tape recording and reproducing equipment. Includes checklist and data collection sheets.

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US ARMY TEST AND EVALUATION COMMAND
TEST OPERATIONS PROCEDURE

DRSTE-RP-702-105 31 December 1980
*Test Operations Procedure 6-2-245
AD No.

AUDIO RECORDING AND REPRODUCING EQUIPMENT, TAPE

1. SCOPE. This test procedure outlines test methods for use in evaluating the performance of audio tape recording and reproducing equipment, including cassettes and cartridges.

1.1 Subtests. Particular subtests required to determine the technical characteristics and to evaluate the performance of specific test items include:

1.1.1 Playback Response. The subtest objective is to determine the test item's playback response capability.

1.1.2 Frequency Response. The subtest objective is to determine the test system's fidelity response to a variety of input frequencies.

1.1.3 Distortion. The subtest objective is to ascertain the degree of distortion generated by the test item.

1.1.4 Flutter and Wow. The subtest objective is to determine the flutter and wow of the test item.

1.1.5 Signal-to-Noise (s/n) Ratio. The subtest objective is to determine the test item's s/n ratio.

1.1.6 Capstan Speed. The subtest objective is to verify the speed and accuracy of the capstan.

1.1.7 Calibration-Indicator Characteristics. The subtest objective is to determine the input frequency at which the calibration meter reflects peak indication, and the input voltage at which the calibration meter reflects a midpoint indication.

*This TOP supersedes MTP 6-2-245, 24 June 1968

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1.1.8 Crosstalk. The subtest objective is to determine the degree to which the test item's harmonic components in one channel leak into another channel.

1.1.9 Erasure Characteristics. The subtest objective is to determine the strength of magnetic field generated by the test item's erase head.

1.1.10 Electrical Power Requirements. Refer to TOP 6-2-514 for the objectives of this subtest.

1.2 Limitations. These test procedures are limited in scope to tape recording and reproduction equipment operating in the audio frequency ranges.

2. FACILITIES AND INSTRUMENTATION. Test items will be put in operating condition following the instructions contained in the appropriate equipment technical manual or manufacturer's operating manual.

2.1 Facilities.

ITEM	REQUIREMENT
Floor and/or bench space	Under ambient laboratory conditions, adequate space for the equipment under test and the instrumentation to be used.

2.2 Instrumentation. All instrumentation used during testing under this procedure will have a current calibration certificate indicating that it meets the requirements outlined in MIL-STD-449D, paragraph 5.1.

ITEM	REQUIREMENT
Audio Oscillator	Frequency ±2% Distortion less than ±2%.
AC Voltmeter	±2 dB.
Distortion Analyzer	Input impedance: >100 K ohms. Harmonic measurement: ±3%. Frequency: ±5%.
Oscilloscope	Horizontal deflection: ±3%. Vertical deflection: ±2%.
Flutter Bridge	Used to measure irregularities in a constant speed tape.
Alignment Tapes	
Flutter Test Tapes	.03% or less flutter using 3,000 Hz tone.
Stop Watch	

1.1.8 Crosstalk. The subtest objective is to determine the degree to which the test item's harmonic components in one channel leak into another channel.

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ITEM	REQUIREMENT
Audio Oscillator	Frequency ±2% Distortion less than ±2%.
AC Voltmeter	±2 dB.
Distortion Analyzer	Input impedance: >100 K ohms. Harmonic measurement: ±3%. Frequency: ±5%.
Oscilloscope	Horizontal deflection: ±3%. Vertical deflection: ±2%.
Flutter Bridge	Used to measure irregularities in a constant speed tape.
Alignment Tapes	
Flutter Test Tapes	.03% or less flutter using 3,000 Hz tone.
Stop Watch	

3. PREPARATION FOR TEST.

3.1 Planning. The test officer will activate a project notebook for each test item, recording in it pertinent descriptive and technical information. The project notebook provides a narrative discussion of test results and is kept current for the duration of the test program. In addition, test planning encompasses a consideration of the potential foreign threat factors that will permit a realistic evaluation of the test item in a threat environment. Complete test planning requires that the test officer:

3.1.1 Prepare a test operations checklist using appendix A as a guide.

3.1.2 Incorporate complete safety aspects within the preparations for the test.

3.1.3 Brief participating test personnel on all aspects of the test program to include the purpose of the test and the precision requirements during test conduct.

3.1.4 Provide sufficient copies of operating instructions to all participating test personnel.

3.2 Facilities. An electronic laboratory with a controlled environment and appropriate power sources.

3.3 Test Item. A record of the test item's nomenclature, serial number(s), manufacturer, and function(s) will be entered in the project notebook. If appropriate, the test item should be photographed from various perspectives. Inspect the test item and associated components for damage, deterioration, and obvious manufacturing defects.

3.4 Instrumentation.

3.4.1 A typical arrangement of equipment for testing is shown in figure 1.

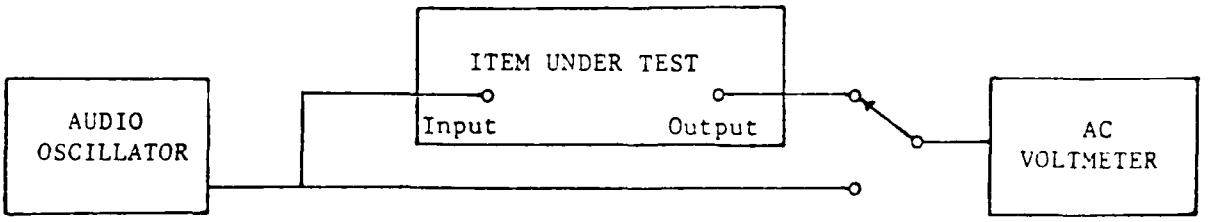

Figure 1 - Equipment Arrangement for Frequency Response Testing

3.4.2 The electronic test facility used during the test should be equipped with the instrumentation listed under paragraph 2.2, above.

3.4.3 Record the nomenclature, serial number(s), accuracy tolerances, cali-

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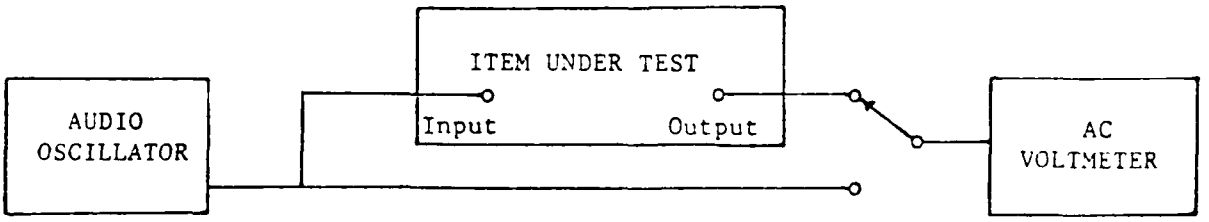


Figure 1 - Equipment Arrangement for Frequency Response Testing

3.4.2 The electronic test facility used during the test should be equipped with the instrumentation listed under paragraph 2.2, above.

3.4.3 Record the nomenclature, serial number(s), accuracy tolerances, calibration requirements, and the last date of calibration for all test equipment used.

4. TEST CONTROLS.

4.1 Playback Response.

4.1.1 Reproducibility, or playback response, testing is undertaken to determine the quality of playback. Although the audio frequency range generally includes those frequencies from 15 to 20,000 Hz, these procedures require investigation between 30 and 15,000 Hz. Testing will use a standard manufacturer's reference level test tape with 15 discrete frequencies in the following order:

a. Start with a 15,000 Hz test tape tone. Adjust the azimuth by positioning the recorder's playback head until its gap is perpendicular to the tape. Azimuth is defined as the angle which the recording and playback head gaps make with the line along which the tape moves.

b. Establish the test item's equalization curve using the remaining test-tape tones as follows:

--12,000 Hz	--3,000 Hz
--10,000 Hz	--1,000 Hz (Zero Reference)
-- 8,000 Hz	-- 500 Hz
-- 7,500 Hz	-- 100 Hz
-- 7,000 Hz	-- 70 Hz
-- 6,000 Hz	-- 50 Hz
-- 5,000 Hz	-- 30 Hz

4.1.2 For the quick alignment of equipment to be tested that has already been through the steps of paragraph 4.1.1, above, an abbreviated version of discrete frequency tones should include the following:

a. Start with a 15,000 Hz test-tape tone for a peak amplitude.

b. In the following order:

--12,000 Hz
-- 7,500 Hz
-- 1,000 Hz
-- 100 Hz

4.1.3 To determine the tone control settings on the test item that yield the flattest response, measure the output signal before it reaches the tone controls and after it has passed through the tone controls. Record the tone control settings and use those settings throughout test conduct.

4.2 Frequency Response. Frequency response can be defined as the variation in voltage gain and phase shift when plotted as a function of the frequency of the applied signal. For audio recording and reproducing equipment, a smooth and flat frequency response is desirable in the frequency range from 30 to 15,000 Hz. Figure 2 below, shows a typical frequency response curve.

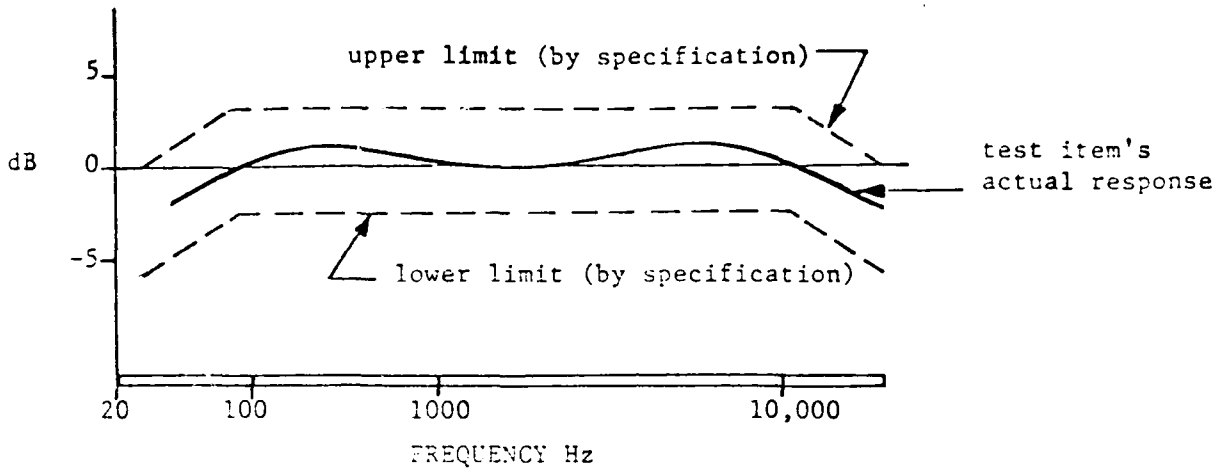


Figure 2 - Type Frequency Response Curve

4.3 Distortion. Harmonic distortion is the production of harmonic frequencies at an output as a result of an applied voltage to the input and the amplitude of distortion is usually a function of the amplitude of the input signal. Distortion in a playback signal is measured on a record level indicator. It is desirable to use a low frequency in a range below 1,000 Hz to facilitate measuring a number of harmonics.

4.4 Flutter and Wow: Flutter is defined as the distortion in a reproduced sound caused by frequency deviations resulting from faulty recording. Wow is the slow variation in the pitch of a reproduced sound. Flutter and wow are measured using calibrated flutter test tapes and a standard flutter bridge. Flutter test tapes contain a 3,000 Hz tone with 0.03 per cent or less flutter; the flutter bridge measures flutter directly. It makes use of a null at a specific frequency and the null point on the test item is then adjusted to the frequency of the recorded tone.

4.5 Signal-to-Noise Ratio. The signal-to-noise (s/n) ratio is measured in decibels indicating the span of signal intensity between a device's overload point at the upper limit and its background noise at the lower limit.

A specific frequency is recorded by the item under test and its playback signal is then measured by a voltmeter. The s/n ratio usually lies between the permissible limit of saturation distortion and the tape's background noise.

4.6 Tape Running Time. Tape running time is dependent on reel size, tape thickness, and the tape speed of the recording and reproducing equipment under test. Tape is categorized according to thickness as: standard play (1.5 mil); long-play (1.0 mil); and double play (0.5 mil).

4.7 Calibration Indicator Characteristics. Verification of the test item's calibration indicator characteristics is accomplished by determining the input frequency that will peak the voltmeter readout. Using that frequency, the input voltage is then adjusted until the mid-point reading on the item's calibration indicator is established.

5. PERFORMANCE TESTS.

5.1 Playback Response.

5.1.1 Connect a voltmeter to the output of the recorder being tested.

5.1.2 In a format like that shown in appendix B, page B-2, record the voltmeter readings for each test frequency (see paragraph 4.1.1) on the test tape.

5.1.3 Repeat step 5.1.2, resetting the tone controls. Record readings for each setting and determine the tone control position yielding the flattest response. (This step does not apply to those test items without tone controls).

5.2 Frequency Response.

5.2.1 Arrange the equipment as shown in figure 1, page 3.

5.2.2 Adjust the output levels to produce a mid-range reading on the AC voltmeter. Make no further adjustments after start of test.

5.2.4 Adjust the tone controls to produce the flattest response in accordance with paragraph 4.1.3 above.

5.2.5 Adjust the audio oscillator to produce the first test frequency. Read and record the oscillator output voltage using the AC voltmeter.

5.2.6 Record this test frequency on a clean tape using the record mode of the test item.

5.2.7 Play back the tape recorded in step 5.2.6 above, using the playback mode of the test item. In a format similar to that shown in appendix B, page B-2, record the AC voltage reading of the playback.

5.2.8 Repeat the above frequency response test steps for each of the test frequencies listed in paragraph 4.1.1 above. The oscillator output amplitude must be adjusted to produce the same AC voltage as recorded in paragraph 5.2.5.

5.3 Distortion.

5.3.1 Arrange the equipment as shown in figure 3 below.

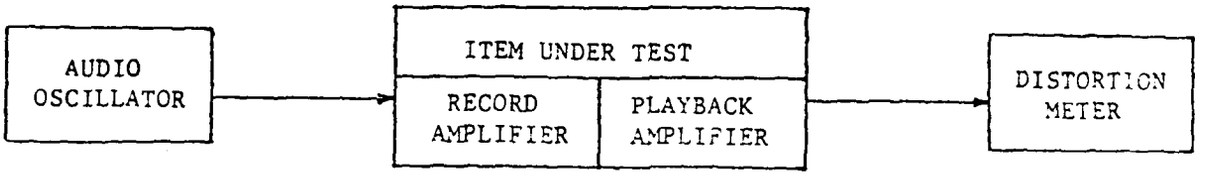


Figure 3 - Equipment Arrangement to Determine Harmonic Distortion

5.3.2 Apply a 1,000 Hz input signal to the recorder or reproducing equipment being tested.

5.3.3 In a format like that shown in appendix B, page B-3, record the output signal as indicated on the distortion meter.

5.4 Flutter and Wow.

5.4.1 Arrange the equipment as shown in figure 4 below:

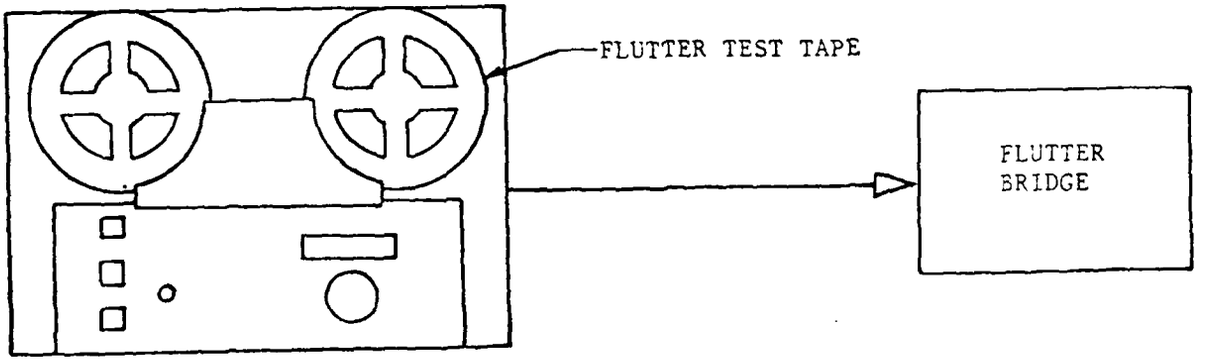


Figure 4 - Equipment Arrangement for Flutter and Wow Measurement

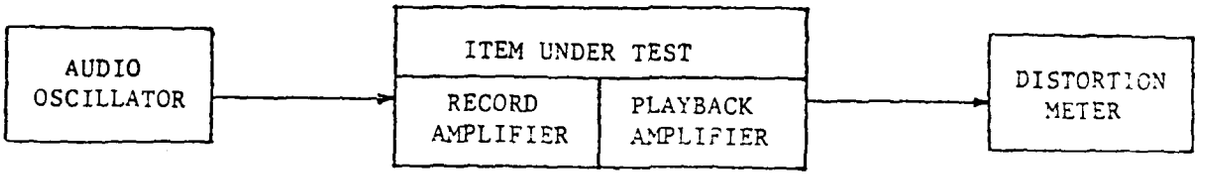
5.4.2 Using a 3,000 Hz tone from a test tape, turn on the recorder or reproducing equipment under test.

5.4.3 Adjust the flutter bridge null to the 3,000 Hz tone frequency.

5.2.8 Repeat the above frequency response test steps for each of the test frequencies listed in paragraph 4.1.1 above. The oscillator output amplitude must be adjusted to produce the same AC voltage as recorded in paragraph 5.2.5.

5.3 Distortion.

5.3.1 Arrange the equipment as shown in figure 3 below.



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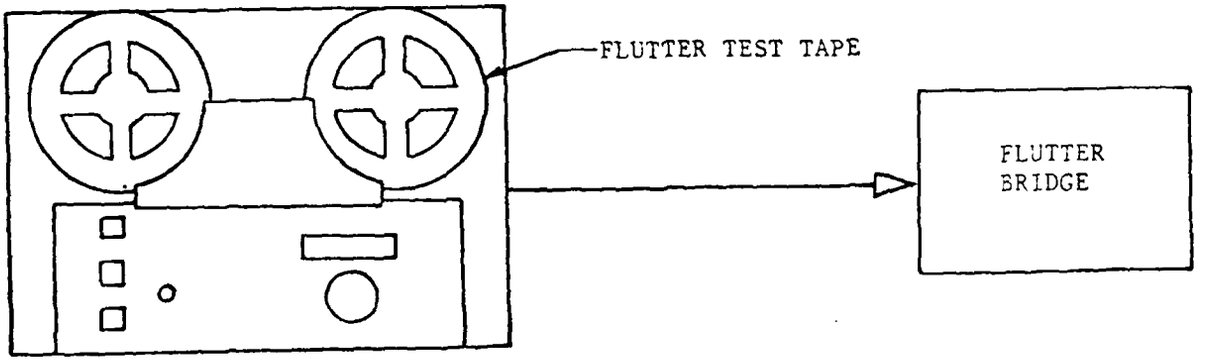

Figure 4 - Equipment Arrangement for Flutter and Wow Measurement

5.4.2 Using a 3,000 Hz tone from a test tape, turn on the recorder or reproducing equipment under test.

5.4.3 Adjust the flutter bridge null to the 3,000 Hz tone frequency.

5.4.4 In a format like that shown in appendix B, page B-4, record the variation in frequency as reflected on the flutter bridge.

5.4.5 Repeat the steps for all available tape speeds.

5.5 Signal-to-Noise Ratio.

5.5.1 Arrange the equipment as shown in figure 3, page 7.

5.5.2 Connect a voltmeter to the output of the recorder or reproducing equipment under test.

5.5.3 Mount an unrecorded cassette or tape on the test item and adjust its recording level to the maximum allowable limit without overdriving the record amplifier.

5.5.4 Disconnect the audio oscillator from the recorder and short circuit the input of the test recorder. Record this reference level on tape.

5.5.5 Repeat step 5.5.3 above.

5.5.6 Using the audio oscillator, apply a specific frequency between 100 and 1,000 Hz to the recorder or reproducing equipment under test and record the audio frequency used.

5.5.7 Replay the tape on the test item. In a format like that shown in appendix B, page B-5, record the output signal as indicated on the AC voltmeter.

5.6 Capstan Speed.

5.6.1 Mount a reel of timing tape of known length on the recorder or reproducing equipment to be tested.

5.6.2 Set the recorder for a particular tape speed.

5.6.3 Use a stop watch to record the time the tape is started on the recorder and the time the tape has been completely run off through the capstan wheel.

5.6.4 Repeat step 5.6.3 for all tape speed settings on the recorder or reproducing equipment under test.

5.6.5 Table 1 on page 9 provides a guide to tape length as a function of reel size and tape thickness. For testing purposes, the exact length of tape must be determined in order to verify the capstan speed.

5.6.6 In a format like that shown in appendix B, page B-6, record the tape run-off time in minutes.

5.4.4 In a format like that shown in appendix B, page B-4, record the variation in frequency as reflected on the flutter bridge.

5.4.5 Repeat the steps for all available tape speeds.

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5.5.1 Arrange the equipment as shown in figure 3, page 7.

5.5.2 Connect a voltmeter to the output of the recorder or reproducing equipment under test.

5.5.3 Mount an unrecorded cassette or tape on the test item and adjust its recording level to the maximum allowable limit without overdriving the record amplifier.

5.5.4 Disconnect the audio oscillator from the recorder and short circuit the input of the test recorder. Record this reference level on tape.

5.5.5 Repeat step 5.5.3 above.

5.5.6 Using the audio oscillator, apply a specific frequency between 100 and 1,000 Hz to the recorder or reproducing equipment under test and record the audio frequency used.

5.5.7 Replay the tape on the test item. In a format like that shown in appendix B, page B-5, record the output signal as indicated on the AC voltmeter.

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5.6.6 In a format like that shown in appendix B, page B-6, record the tape run-off time in minutes.

TAPE THICKNESS \ REEL SIZE	5"	7"	10"
0.5 Mil	1800'	3600'	7200'
1.0 Mil	900'	1800'	3600'
1.5 Mil	600'	1200'	2400'

Table 1 - Approximate Tape Length, Shown in Feet

5.6.7 Compare the recorded times to run off the tapes with the data provided in Table 2 below.

TAPE SPEED(ips) \ LENGTH IN FEET	600'	900'	1200'	1800'	2400'	3600'	7200'
1.875	64	96	128	192	256	384	768
3.75	32	48	64	96	128	192	384
7.5	16	24	32	48	64	96	192
15.0	8	12	16	24	32	48	96

Table 2 - Tape Run-off Times in Minutes

5.7 Calibration-Indicator Characteristics.

5.7.1 Arrange the equipment as shown in figure 1, page 3.

5.7.2 Adjust the input frequency from the audio oscillator to produce a peak allowable reading on the voltmeter and record this frequency in a format like that shown at appendix B, page B-7.

5.7.3 Using the same audio frequency, adjust the input voltage to produce a mid-point indication on the voltmeter and record that reading.

5.8 Crosstalk.

5.8.1 Arrange the equipment as shown in figure 1, page 3.

5.8.2 Feed a signal of known frequency from the audio oscillator into one channel (channel A) of the test item and record the voltage as indicated on the voltmeter in a format shown at appendix B, page B-8.

5.8.3 Measure and record the size of the fundamental frequency and its harmonic components at the output of the test item's second channel (channel B).

5.8.4 Repeat the test by changing channels: recording on channel B, using the same frequency at the same voltage, and measuring the output on channel A.

5.9 Erasure Characteristics.

5.9.1 Arrange the equipment for testing in a manner similar to that shown in figure 1, page 3.

5.9.2 Prepare a new, unrecorded test tape by marking it in 10 75-inch segments with splicing tape attached to the non recording (shiney) side of the tape.

5.9.3 Identify each 75-inch segment sequentially from one to 10.

5.9.4 Select a recording speed for the test item and record the speed used on a data collection sheet similar in format to appendix B, page B-9.

5.9.5 Play the unrecorded test tape on the test item and record the maximum noise level indicated for each segment of the tape as V_1.

5.9.6 Record a 15,000 Hz tone on segment one of the test tape with the volume control set at the mid-point level.

5.9.7 On the second segment of tape, repeat step 5.9.6 with the volume control at its maximum setting before overload (high level).

5.9.8 Repeat steps 5.9.6 and 5.9.7 on subsequent segments of tape using the test tone frequencies shown in paragraph 4.1.2b, above.

5.9.9 Play back the recordings made on segments one through 10 at each recording speed and record the power levels observed at each test tone frequency as the recorded level, V_2.

5.9.10 Using the test item's erase mode, erase the recordings made on each segment of the test tape.

5.9.11 Play back the erased test tape and record the new noise levels as the erasure level, V_3.

5.9.12 Using the remaining recording speeds for which the test item is capable, repeat steps 5.9.5 through 5.9.11 above.

5.10 Electrical Power Requirements. The engineering subtests required for the determination of the electrical power requirements of recorders and audio reproducing equipment are outlined in TOP 6-2-514, paragraphs 5 and 6.

5.8.2 Feed a signal of known frequency from the audio oscillator into one channel (channel A) of the test item and record the voltage as indicated on the voltmeter in a format shown at appendix B, page B-8.

5.8.3 Measure and record the size of the fundamental frequency and its harmonic components at the output of the test item's second channel (channel B).

5.8.4 Repeat the test by changing channels: recording on channel B, using the same frequency at the same voltage, and measuring the output on channel A.

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5.9.10 Using the test item's erase mode, erase the recordings made on each segment of the test tape.

5.9.11 Play back the erased test tape and record the new noise levels as the erasure level, V_3.

5.9.12 Using the remaining recording speeds for which the test item is capable, repeat steps 5.9.5 through 5.9.11 above.

5.10 Electrical Power Requirements. The engineering subtests required for the determination of the electrical power requirements of recorders and audio reproducing equipment are outlined in TOP 6-2-514, paragraphs 5 and 6.

6. DATA REDUCTION AND PRESENTATION.

6.1 PLAYBACK RESPONSE.

6.1.1 Reproducibility or playback response test data will be presented in a format as outlined in appendix B, page B-2.

6.1.2 A comparison of the test data accumulated above will be presented with the applicable test criteria.

6.2 Frequency Response.

6.2.1 A type frequency response curve is shown in figure 2, page 5.

6.2.2 Frequency response test data will be recorded in a format similar to that shown in appendix B, page B-2.

6.2.3 Using the plot made for the test criteria, plot a frequency response curve reflecting the performance of the recorder or reproducing equipment tested.

6.3 Distortion.

6.3.1 Harmonic distortion test data will be recorded in a format similar to that shown in appendix B, page B-3.

6.3.2 Distortion data will be tabulated and compared with the applicable test criteria.

6.4 Flutter and Wow.

6.4.1 Flutter and wow test data will be recorded in a format similar to that shown in appendix B, page B-4.

6.4.2 Make a tabular comparison of the test data with the applicable test criteria.

6.5 Signal-to-Noise Ratio.

6.5.1 Signal-to-noise data will be recorded in a format similar to that shown in appendix B, page B-5.

6.5.2 Make a tabular comparison of the test data with the applicable test criteria.

6.6 Capstan Speed.

6.6.1 Capstan speed data will be recorded in a format similar to that shown in appendix B, page B-6.

6.6.2 Present a tabular comparison of the tape running times recorded for the test item with the standard running times shown in table 2, page 9.

6. DATA REDUCTION AND PRESENTATION.

6.1 PLAYBACK RESPONSE.

6.1.1 Reproducibility or playback response test data will be presented in a format as outlined in appendix B, page B-2.

6.1.2 A comparison of the test data accumulated above will be presented with the applicable test criteria.

6.2 Frequency Response.

6.2.1 A type frequency response curve is shown in figure 2, page 5.

6.2.2 Frequency response test data will be recorded in a format similar to that shown in appendix B, page B-2.

6.2.3 Using the plot made for the test criteria, plot a frequency response curve reflecting the performance of the recorder or reproducing equipment tested.

6.3 Distortion.

6.3.1 Harmonic distortion test data will be recorded in a format similar to that shown in appendix B, page B-3.

6.3.2 Distortion data will be tabulated and compared with the applicable test criteria.

6.4 Flutter and Wow.

6.4.1 Flutter and wow test data will be recorded in a format similar to that shown in appendix B, page B-4.

6.4.2 Make a tabular comparison of the test data with the applicable test criteria.

6.5 Signal-to-Noise Ratio.

6.5.1 Signal-to-noise data will be recorded in a format similar to that shown in appendix B, page B-5.

6.5.2 Make a tabular comparison of the test data with the applicable test criteria.

6.6 Capstan Speed.

6.6.1 Capstan speed data will be recorded in a format similar to that shown in appendix B, page B-6.

6.6.2 Present a tabular comparison of the tape running times recorded for the test item with the standard running times shown in table 2, page 9.

6.7 Calibration Indicator Characteristics.

6.7.1 Calibration indicator characteristics data will be recorded in a format similar to that shown in appendix B, page B-7.

6.7.2 Make a tabular presentation of the input frequency at which a peak indication is achieved on the voltmeter and the input voltage level at which the voltmeter reflects a mid-point indication.

6.8 Cross Talk.

6.8.1 Cross-talk data will be recorded in a format similar to that shown in appendix B, page B-8.

6.8.2 Present a tabular comparison of the input frequencies to channels A and B and the output voltages for channels B and A, respectively.

6.9 Erasure Characteristics.

6.9.1 Reduce data taken for the erasure characteristics subtest into a format similar to that shown in appendix B, page B-9.

6.9.2 Compute the test item's erasure efficiency, E_e, using the following relationships:

$$E_e = \frac{V_2 - V_3}{V_2 - V_1}$$

Where: V_1 = The noise level of the clean test tape.

V_2 = The recorded level.

V_3 = The erasure level.

6.9.3 Present erasure characteristics data in a graphical format similar to that shown in figure 5.

6.10 Electrical Power Requirements.

6.10.1 The data reduction and presentation requirements associated with the electrical power requirements for recorders and reproducing equipment are outlined in TOP 6-2-514.

6.10.2 Data reduction will include the results of testing equipment warm-up time, the range of power requirements for test items, the impact of frequency variations on the test item, and the impact of voltage variations on the test item.

6.7 Calibration Indicator Characteristics.

6.7.1 Calibration indicator characteristics data will be recorded in a format similar to that shown in appendix B, page B-7.

6.7.2 Make a tabular presentation of the input frequency at which a peak indication is achieved on the voltmeter and the input voltage level at which the voltmeter reflects a mid-point indication.

6.8 Cross Talk.

6.8.1 Cross-talk data will be recorded in a format similar to that shown in appendix B, page B-8.

6.8.2 Present a tabular comparison of the input frequencies to channels A and B and the output voltages for channels B and A, respectively.

6.9 Erasure Characteristics.

6.9.1 Reduce data taken for the erasure characteristics subtest into a format similar to that shown in appendix B, page B-9.

6.9.2 Compute the test item's erasure efficiency, E_e, using the following relationships:

$$E_e = \frac{V_2 - V_3}{V_2 - V_1}$$

Where: V_1 = The noise level of the clean test tape.

V_2 = The recorded level.

V_3 = The erasure level.

6.9.3 Present erasure characteristics data in a graphical format similar to that shown in figure 5.

6.10 Electrical Power Requirements.

6.10.1 The data reduction and presentation requirements associated with the electrical power requirements for recorders and reproducing equipment are outlined in TOP 6-2-514.

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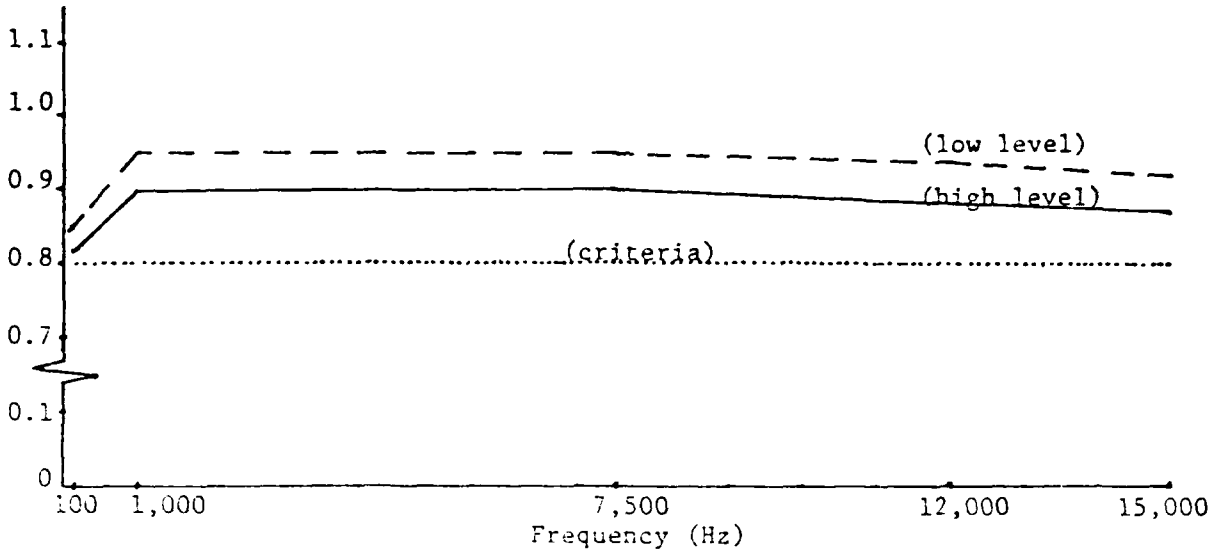

Figure 5 - Erasure Efficiency as a Function of Frequency

Recommended changes to this publication should be forwarded to Commander, U.S. Army Test and Evaluation Command, ATTN: DRSTE-AD-M, Aberdeen Proving Ground, MD 21005. Technical information may be obtained from Commander, U.S. Army Electronic Proving Ground, ATTN: STEEP-MT-T, Fort Huachuca, AZ 85613. Additional copies are available from the Defense Technical Information Center, Cameron Station, Alexandria, VA 22314. This document is identified by the accession number (AD No.) printed on the first page.

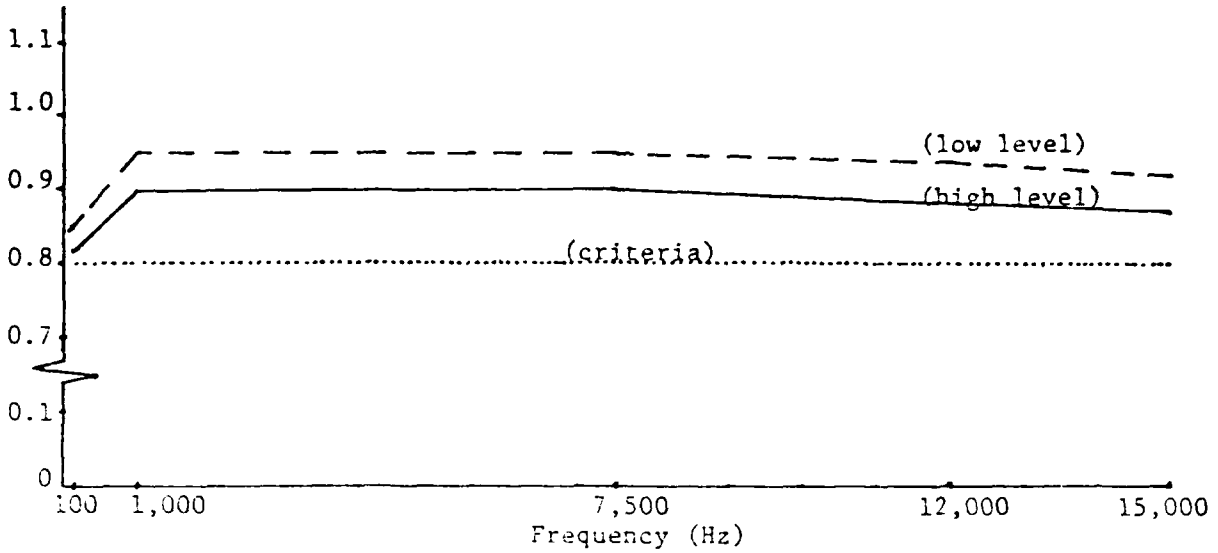

Figure 5 - Erasure Efficiency as a Function of Frequency

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APPENDIX A

CHECKLIST FOR AUDIO RECORDING AND REPRODUCING EQUIPMENT TESTS

	INITIALS	
	Test Officer	Test Supervisor
Availability of appropriate documentation and authority for the conduct of the test program:		
Initiate a project notebook:		
Establish the project file:		
Availability of appropriate references:		
Required Operational Capability (ROC):		
Test item specifications:		
Military Standards:		
Test Operations Procedures:		
Operating Manuals:		
Coordination with test sponsor/contractor:		
Are dates for desired test execution realistic?		
Availability of test plan to all participants:		
Coordination for necessary test support:		
Identification of critical test issues:		
Test facility conforms to specified standards:		
Brief all test personnel:		
Instrumentation data have been recorded:		
Instrumentation has been currently calibrated:		
Test item data recorded in project notebook:		
Reference level test tapes are on hand:		
Initial inspection performed:		
Photographs taken of test item(s):		
Equipment performance reports prepared:		
Data collection sheets are complete:		
Test report prepared:		

APPENDIX A

CHECKLIST FOR AUDIO RECORDING AND REPRODUCING EQUIPMENT TESTS

	INITIALS	
	Test Officer	Test Supervisor
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Required Operational Capability (ROC):		
Test item specifications:		
Military Standards:		
Test Operations Procedures:		
Operating Manuals:		
Coordination with test sponsor/contractor:		
Are dates for desired test execution realistic?		
Availability of test plan to all participants:		
Coordination for necessary test support:		
Identification of critical test issues:		
Test facility conforms to specified standards:		
Brief all test personnel:		
Instrumentation data have been recorded:		
Instrumentation has been currently calibrated:		
Test item data recorded in project notebook:		
Reference level test tapes are on hand:		
Initial inspection performed:		
Photographs taken of test item(s):		
Equipment performance reports prepared:		
Data collection sheets are complete:		
Test report prepared:		

APPENDIX B

DATA COLLECTION SHEETS

APPENDIX B

DATA COLLECTION SHEETS

DATA COLLECTION SHEET #1

TYPE OF TEST:

Playback Response: ☐

Frequency Response: ☐ (Use flattest tone control setting [see para. 4.1.3]).

Frequency (Hz)	VOLTMETER READING (VOLTS)									
	BASS SETTING					TREBLE SETTING				
	0	25%	50%	75%	Max	0	25%	50%	75%	Max
15,000										
12,000										
10,000										
8,000										
7,500										
7,000										
6,000										
5,000										
3,000										
1,000										
500										
100										
70										
30										

DATA COLLECTION SHEET #1

TYPE OF TEST:

Playback Response: ☐

Frequency Response: ☐ (Use flattest tone control setting [see para. 4.1.3]).

Frequency (Hz)	VOLTMETER READING (VOLTS)									
	BASS SETTING					TREBLE SETTING				
	0	25%	50%	75%	Max	0	25%	50%	75%	Max
15,000										
12,000										
10,000										
8,000										
7,500										
7,000										
6,000										
5,000										
3,000										
1,000										
500										
100										
70										
30										

DATA COLLECTION SHEET #2

(Distortion)

INPUT SIGNAL	DISTORTION METER READING	TEST CRITERIA
1,000 Hz		

DATA COLLECTION SHEET #2

(Distortion)

INPUT SIGNAL	DISTORTION METER READING	TEST CRITERIA
1,000 Hz		

DATA COLLECTION SHEET #3

(Flutter and Wow)

TAPE SPEED (ips)	FLUTTER BRIDGE READING	TEST CRITERIA
1.875		
3.75		
7.5		
15.0		

DATA COLLECTION SHEET #3

(Flutter and Wow)

TAPE SPEED (ips)	FLUTTER BRIDGE READING	TEST CRITERIA
1.875		
3.75		
7.5		
15.0		

DATA COLLECTION SHEET #4

(Signal-to-Noise Ratio)

FREQUENCY IN Hz	VOLTMETER READING WITH SHORTED INPUT	VOLTMETER READING OF RECORDED SIGNAL	SPECIFIED CRITERIA
100-1,000			

DATA COLLECTION SHEET #4

(Signal-to-Noise Ratio)

FREQUENCY IN Hz	VOLTMETER READING WITH SHORTED INPUT	VOLTMETER READING OF RECORDED SIGNAL	SPECIFIED CRITERIA
100-1,000			

DATA COLLECTION SHEET #5

(Capstan Speed)

TAPE SPEED (ips)	TAPE LENGTH						
	600'	900'	1200'	1800'	2400'	3600'	7200'
1.875							
3.75							
7.5							
15.0							

Notes:

1. Time for each tape speed will be shown in minutes.
2. Refer to Table No. 2, page 9, TOP 6-2-245.

DATA COLLECTION SHEET #5

(Capstan Speed)

TAPE SPEED (ips)	TAPE LENGTH						
	600'	900'	1200'	1800'	2400'	3600'	7200'
1.875							
3.75							
7.5							
15.0							

Notes:

1. Time for each tape speed will be shown in minutes.
2. Refer to Table No. 2, page 9, TOP 6-2-245.

DATA COLLECTION SHEET #6

(Calibration Indicator)

FREQUENCIES & INSTRUMENTATION USED	INDICATIONS	
	Mid-point	Peak
OSCILLATOR FREQUENCY	N/A	
RECORDED FREQUENCY		N/A
VOLTMETER		

DATA COLLECTION SHEET #7

(Cross Talk)

RECORD	VOLTS	PLAYBACK	VOLTS
Input to Channel A		Output at Channel B	
Input to Channel B		Output at Channel A	

DATA COLLECTION SHEET #7

(Cross Talk)

RECORD	VOLTS	PLAYBACK	VOLTS
Input to Channel A		Output at Channel B	
Input to Channel B		Output at Channel A	

DATA COLLECTION SHEET #8

(Erasure Characteristics)

TAPE SPEED USED:_____

Test Tape Segment*	Clean Test Tape Noise Level, V_1	Frequency (Hz)	Recorded Level, V_2	Erasure Level, V_3	Erasure Efficiency $\frac{V_2 - V_3}{V_2 - V_1}$
1		15,000 Mid Level			
2		High Level			
3		12,000 Mid Level			
4		High Level			
5		7,500 Mid Level			
6		High Level			
7		1,000 Mid Level			
8		High Level			
9		100 Mid Level			
10		High Level			

*Identify test tape segments using splicing tape affixed to the nonrecording (shiny) side of the test tape.

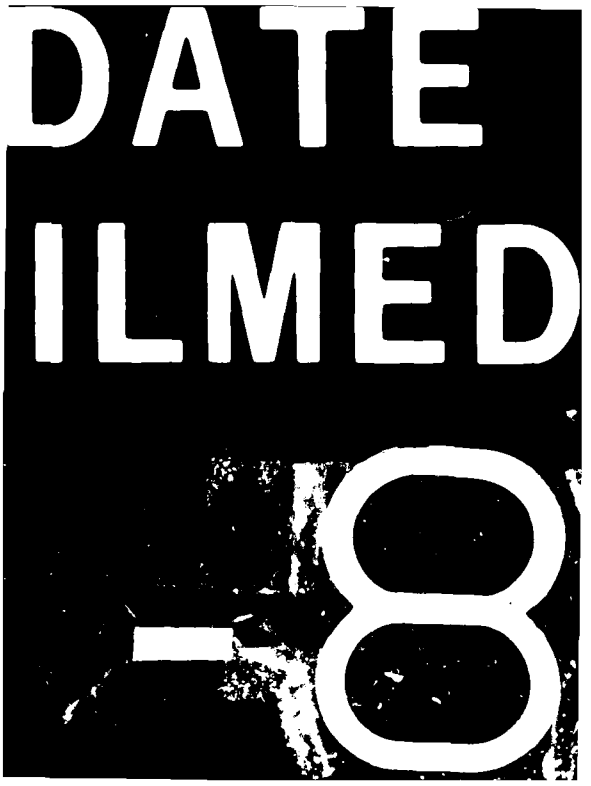
DATA COLLECTION SHEET #8

(Erasure Characteristics)

TAPE SPEED USED:_____

Test Tape Segment*	Clean Test Tape Noise Level, V_1	Frequency (Hz)	Recorded Level, V_2	Erasure Level, V_3	Erasure Efficiency $\frac{V_2 - V_3}{V_2 - V_1}$
1		15,000 Mid Level			
2		High Level			
3		12,000 Mid Level			
4		High Level			
5		7,500 Mid Level			
6		High Level			
7		1,000 Mid Level			
8		High Level			
9		100 Mid Level			
10		High Level			

*Identify test tape segments using splicing tape affixed to the nonrecording (shiny) side of the test tape.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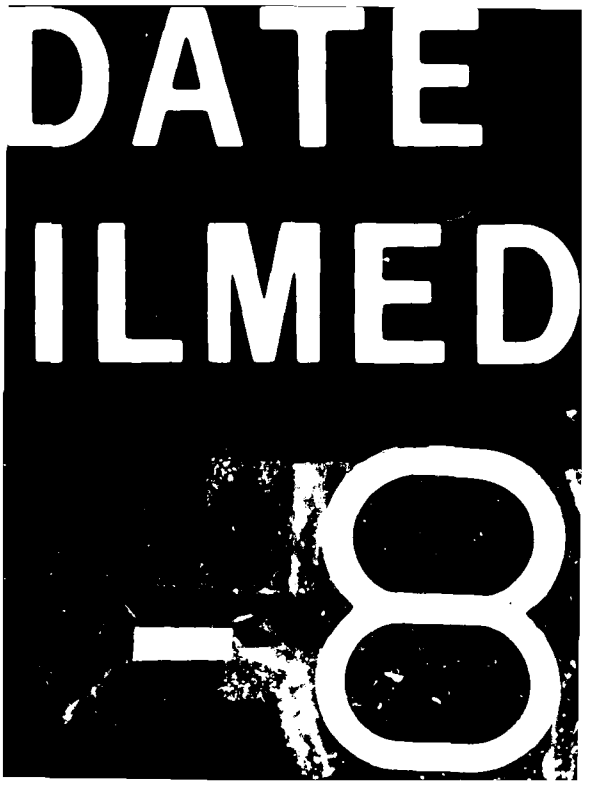
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